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(54) A change speed transmission

(57) The transmission includes gear trains which provide increasing speed ratios and two clutches 14, 24 which are independently operable and provide alternative drive paths through the gear trains between an input shaft of an engine and an output shaft 37. The gear trains provide alternative ratios driven respectively through one and the other clutch and an idler gear is provided for transmitting drive to both clutches from the input shaft.

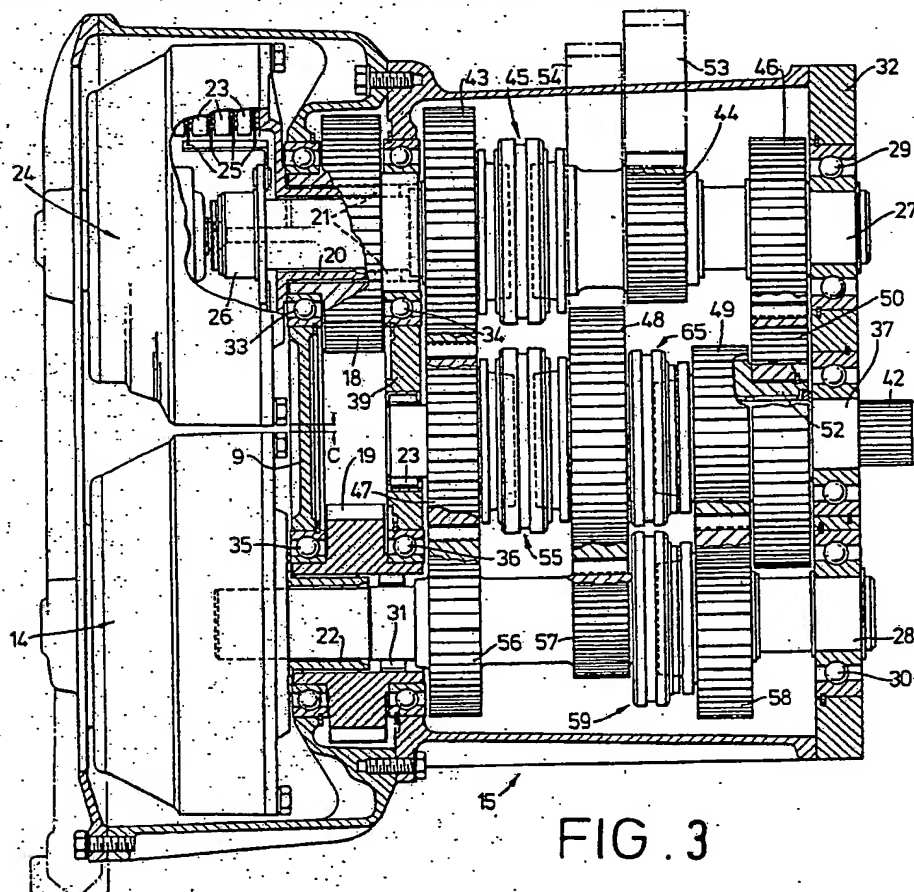


FIG. 3

The drawing(s) originally filed was (were) informal and the print here reproduced is taken from a later filed formal copy.

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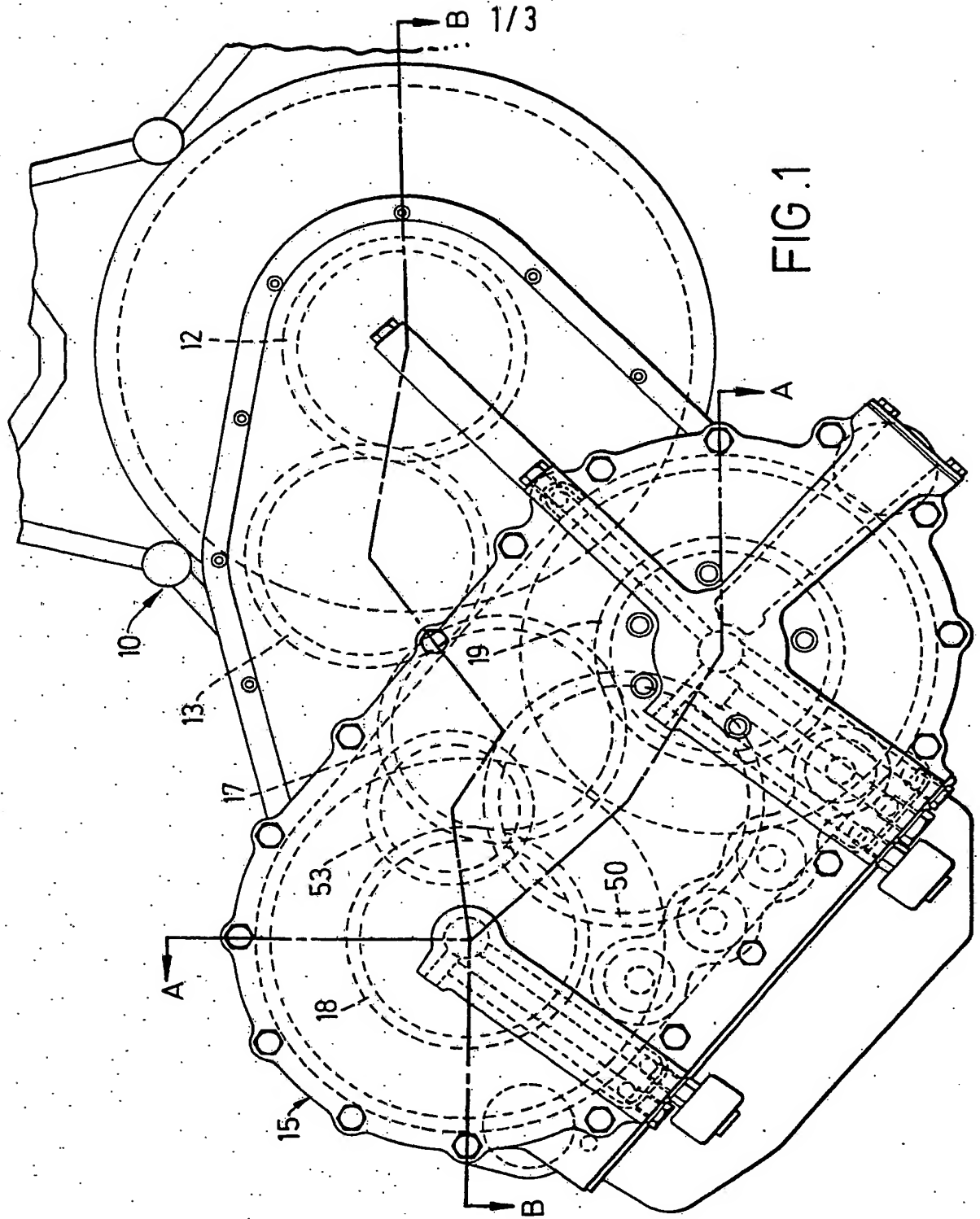
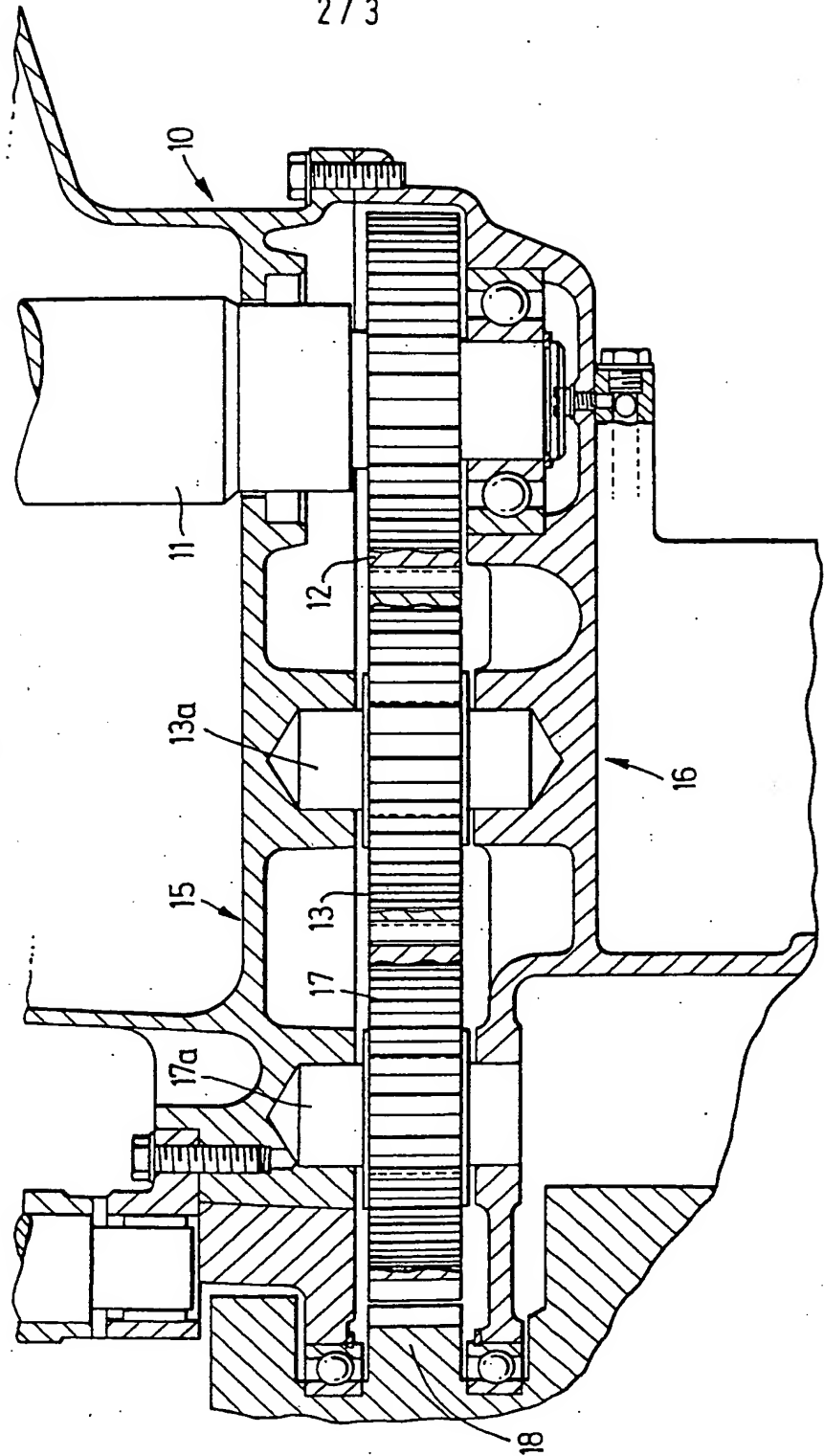
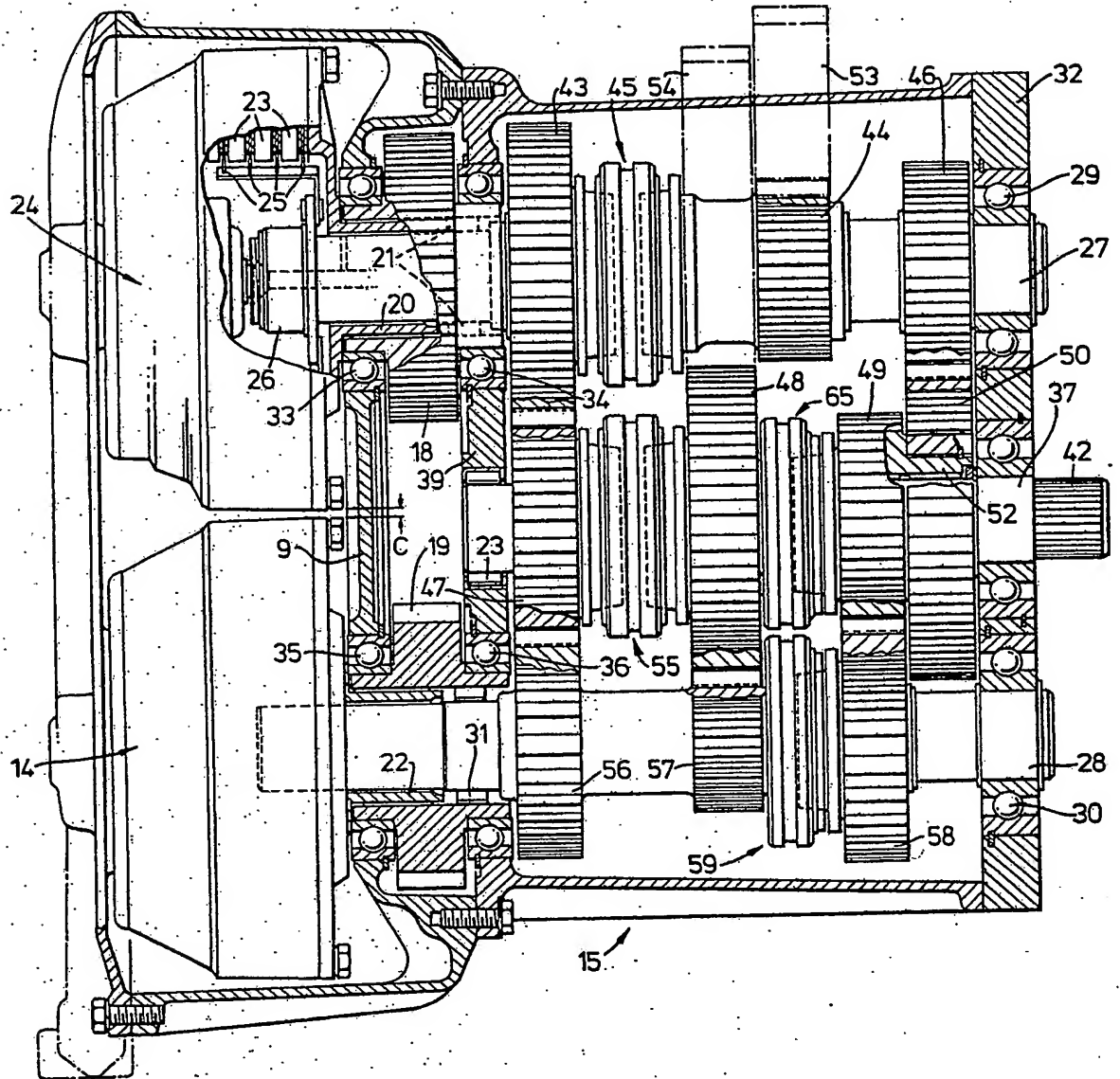


FIG. 2



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A CHANGE SPEED TRANSMISSION

The invention relates to a change speed transmission preferably for a vehicle. In particular the transmission is of the dual clutch kind including gear trains which provide increasing speed ratios and two clutches which are independently operable and provide alternative drive paths through the gear trains between an input and an output, the gear trains providing alternate ratios driven respectively through one and the other clutch.

According to the invention there is provided a change speed transmission including gear trains which provide increasing speed ratios and two clutches which are independently operable and provide alternative drive paths through the gear trains between an input and an output, the gear trains providing alternate ratios driven respectively through one and the other clutch and an idler gear for transmitting drive to both clutches from a drive shaft of an engine.

Preferably, each clutch is drivably connected to an input drive gear, both input drive gears being in mesh with said idler gear.

The said idler gear preferably meshes with at least one further idler gear through which drive is transmitted from the drive shaft of the engine.

The twin clutch transmission may include a first shaft drivable by one clutch, a second shaft drivable by the other clutch and an output shaft to which drive is transmitted in one ratio from said first shaft and in another ratio from said second shaft.

In order to minimise the size of the transmission; the two clutches may be positioned closely adjacent each other with the entire output shaft axially offset from the clutches.

The transmission may include a casing having a wall portion in which an end of said output shaft nearest the clutches is rotatably mounted. Where each clutch is drivably connected to an input drive gear, said input drive gears may be arranged
5 between said wall portion and the clutches.

Preferably the first, second and output shafts carry gears which mesh to enable drive to be transmitted to the output shaft and, in such a case, each shaft may carry selector means for drivably connecting at least one of the gears thereon
10 to its shafts.

In one of the selected ratios, drive to the output shafts may be transmitted through gears carried by all of said shafts.

In a selected ratio, drive to the output shaft may be transmitted through at least two, and preferably three gears carried by
15 said output shaft.

A change speed transmission in accordance with the invention will now be described by way of example with reference to the accompanying drawings in which:

Fig. 1 is an end view of a transmission in accordance with
20 the invention mounted on an engine, and

Figs. 2 and 3 are cross sections of the transmission of Fig. 1 on the lines A-A and B-B in Fig. 1.

In Figs. 1 and 2 an engine 10 has a drive shaft 11 which is splined to a gear wheel 12. The gear wheel 12 meshes with
25 a first idler gear 13 journaled on a fixed shaft 13a. One end of the shaft 13a is mounted on a gearbox casing 15 and the other end is mounted on an end cover 16 bolted to the engine 10 and casing 15. The idler gear 13 meshes with a

second idler gear 17 which is journaled on a shaft 17a mounted on the gearbox casing 15 and end cover 16.

The idler gear 17 meshes with two input gears 18,19 (see also Fig. 3) which are splined to respective hollow input shafts 20,22. The input shaft 22 is rotatably fast with spaced driving members 23 of a first fluid operable clutch 24. The clutch 24 includes driven members 25 disposed between the members 23 and rotatably fast with a sleeve 26 splined to a first shaft 27 of the transmission. The input shaft 22 carries driving members (not shown) of a second fluid-operable clutch 14 similar to members 23 which co-act with driven members (also not shown) splined to a second shaft 28 of the transmission. The right hand ends of the shafts 27,28 are journaled in respective bearings 29,30 in an end wall 32 of the gearbox casing 15, and the input gears 18 and 19 are journaled in bearings 33,34 and 35,36 in opposite end walls 9,39 of the casing 15. The left hand ends of shafts 27,28 are journaled in bearings 21,31 within the gear wheels 18,19 respectively.

An output shaft 37 has its left hand end as viewed in Fig. 3 journaled in a bearing 38 in wall 39 of the casing 15 and its right hand end journaled in a bearing 40 in the end wall 32. The output shaft is splined at 42 to engage an input gear wheel (not shown) or a propeller shaft for driving a differential gearing (also not shown).

The first shaft 27 rotatably supports two gear wheels 43,44, which can be selectively drivably connected to the shaft by a conventional synchromesh selector 45, and is rotatably fast with a gear wheel 46.

The output shaft 37 rotatably supports four gear wheels 47, 48, 49 and 50, the gear wheel 50 being splined to an extension 52 of gear wheel 49. Gear wheel 47 meshes with gear wheel

43 and gear wheel 50 meshes with gear wheel 46. A compound reversing gear comprising gear wheels 53 and 54 is arranged between gear wheels 44 and 48, the former meshing with gear wheel 53 and the latter with gear wheel 54. Gear wheels 47, 5 48 can be selectively drivably connected to the shaft 37 by a synchromesh selector 55 and gear wheel 49 (and hence 50) can be similarly drivably connected to the shaft 37 by a synchromesh selector 65.

The second shaft 28 is rotatably fast with gear wheels 56,57 10 in mesh with respective gear wheels 47,48 and rotatably supports a gear wheel 58 in mesh with gear wheel 49. The gear wheel 58 is selectively drivably connectable to the shaft 28 by a synchromesh selector 59.

Operation of the transmission when installed in a vehicle 15 is as follows, moving of selectors and operation of the clutches 24,14 being effected by an automatic gearbox control system (not shown).

With the engine running, both clutches 24,14 are initially disengaged and the selectors 45,55,59 and 65 are also initially 20 disengaged.

To move off from rest in first ratio, the selectors 55,59 are moved to the right as viewed in Fig. 3 to drivably connect gear wheels 48,58 to the shaft 28. The clutch 24 is engaged and the output shaft 37 is then driven through gear wheels 25 46,50, 49, 58,57 and 48. Hence the output shaft is driven through gearing carried by all three shafts 27,28 and 37.

To engage second ratio, clutch 14 is engaged and clutch 24 is disengaged at an appropriate time so as to drive the output shaft 37 through gear wheels 57,48. Selector 65 is then moved 30 to the right to drivably connect gear wheels 49,50 to the output shaft 37 thereby pre-selecting third ratio.

Third ratio is obtained by engaging clutch 24 and disengaging clutch 14 so as to drive the output shaft 37 through gear wheels 46,50. Fourth ratio is preselected by moving selector 55 to the left to drivably connect gear wheel 47 to the second shaft 37.

Fourth ratio is then obtained by engaging clutch 14 and disengaging clutch 24 so as to drive the output shaft 37 through gear wheels 56,47. Fifth ratio is pre-selected by moving selector 45 to the left to drivably connect gear wheel 43 to the first shaft 27.

Fifth ratio is then obtained by engaging clutch 24 and disengaging clutch 14 so as to drive the output shaft 37 through gear wheels 43,47.

Reverse ratio is selected by moving selectors 45 and 55 to the right to drivably connect gear wheel 44 to the first shaft 27 and to drivably connect gear wheel 47 to the shaft 37.

Clutch 24 is then engaged with clutch 14 disengaged so as to transmit reverse drive to output shaft 37 through gear wheels 44,53, 54 and 48.

As apparent from Figs. 1 and 2, the transmission is positioned alongside the engine to minimise the length of the transmission and engine assembly. Also, the entire output shaft 37 is positioned axially to the right of clutches 24,14 thereby keeping spacing between the first and second shafts 27,28 and hence the width of the transmission to a minimum. It can be seen in Fig. 3 that the clutches are spaced by only a small clearance C as the output shaft 37 does not need to pass between them.

Moreover, the positioning of a clutch on each shaft 27,28 and the use of idler gears 13,17 enables the overall length of the engine and transmission assembly to be less than if the clutches 24,14 were arranged in tandem coaxially with the engine output shaft 11.

CLAIMS

1. A change-speed transmission including gear trains which provide increasing speed ratios and two clutches which are independently operable and provide alternative drive paths through the gear trains between an input and an output, the gear trains providing
6 alternate ratios driven respectively through one and the other clutch and an idler gear for transmitting drive to both clutches from a drive shaft of an engine.
2. A change speed transmission according to Claim 1 in which each clutch is drivably connected to an input drive gear both
10 input drive gears being in mesh with said idler gear.
3. A change speed transmission according to Claim 1 in which said idler gear meshes with at least one further idler gear through which drive is transmitted from the drive shaft of the engine.
4. A change speed transmission according to any preceding claim
15 in which the transmission includes a first shaft drivable by one clutch, a second shaft drivable by the other clutch and an output shaft to which drive is transmitted in one ratio from said first shaft and in another ratio from said second shaft.
5. A change speed transmission according to Claim 4 in which
20 the two clutches are closely adjacent each other and the entire output shaft is axially offset from said clutches.
6. A change speed transmission according to Claim 5 in which the transmission includes a casing having a wall portion in which an end of said output shaft nearest the clutches is rotatably
25 mounted.
7. A change speed transmission according to Claim 6 and where each clutch is drivably connected to an input drive gear in which said input drive gears lie between said wall portion and said

clutches.

8. A change speed transmission according to any of Claims 4 to 7 in which said first, second and output shafts carry gears which mesh to enable drive to be transmitted to the output shaft.
- 5 9. A change speed transmission according to Claim 8 in which each shaft carries selector means for drivably connecting at least one of the gears thereon to its shaft.
- 10 10. A change speed transmission according to any of claims 4 to 9 in which in one ratio drive to the output shaft is transmitted through gears carried by all of said shafts.
11. A change speed transmission according to any of claims 4 to 10 in which in one ratio, drive to said output shaft is transmitted through at least two gears carried by said output shaft.
- 15 12. A change speed transmission constructed and arranged substantially as described herein with reference to the accompanying drawings.